COMPUTER-TELEPHONE INTERFACE METHOD AND APPARATUS

BACKGROUND OF THE INVENTION

The present invention relates to input and output devices for computer systems. More particularly, the subject invention relates to an interface method and apparatus which enable a general purpose personal computer to control and/or perform certain of the switching and signalling functions of a telephone.

With the miniaturization of computer circuitry and the associated reduction in the cost of computing apparatus, small digital computer systems, often called personal computers, are increasingly being utilized in business offices and residential homes. Such personal computers are used within an office for a wide variety of tasks or applications including word processing, records storage, order entry, calendar reminder systems, bookkeeping, generation of standardized letters/forms, and storage/retrieval of information from data bases. Because such personal computers are usually general purpose devices, i.e., they are not programmed for the performance of a single, specific application, many offices operate plural applications on the same computer. Thus, it is not at all uncommon for business persons to spend a large percentage of working hours operating a personal computer in one or more of the above mentioned or other applications.

Most personal computers are operated through the manipulation of a standard typewriter keyboard which electrically communicates with a general purpose computer program, usually called an operating system program, of the personal computer to read, store, or manipulate files of data within the computer to the end desired by the computer user. As such, the operation of a personal computer is usually performed most efficiently by the use of both hands of the user in standard typewriting fashion.

Other input devices, such as mouses and light pens, which may be efficiently operated by one hand have come to be utilized for some applications. However, in certain contexts, such as the entry of textual data, such input devices are often less efficient than a typewriter keyboard.

Many persons who utilize a personal computer in their activities frequently require the use of a telephone while using the computer. Persons such as telephone order takers, "hot line" operators, office clerical personnel, and the like exemplify such persons. As a conventional telephone instrument, comprising a base and handset generally requires the use of one hand to hold the handset in place against the head of the user, it becomes awkward to operate the computer keyboard and hold a telephone handset simultaneously.

To reduce the difficulty of simultaneously operating a keyboard and holding a telephone handset, it is known to replace the handset with a headset comprising an earpiece, microphone, and headband to affix the earpiece and microphone adjacent the appropriate locations on the user's head. Such an arrangement frees the user from having constantly to hold a handset and thus enables ready use of the computer keyboard. Even with such use of headsets, however, some clumsiness is entailed as a switch must be located near the user to take the place of the telephone's hook switch within the cradle of a telephone receiver. As there is no longer a handset to be placed in the cradle to operate the hook switch, a manual switch has usually been substituted.

If the user of a headset desires to place calls, and not merely answer them, a conventional telephone instrument has generally been required in addition to the computer. The telephone instrument is utilized, primarily, for operation of its keypad which sends dialing signals on the telephone line to instruct the telephone system what other telephone is to be joined in a desired communication. As a typical personal computer and keyboard consume a considerable amount of room on a typical work desk, a telephone instrument needed for dialing functions must often be placed out of reach of the person sitting at the computer keyboard, again making for a clumsy arrangement wherein the user must move away from his/her work station, the computer keyboard, in order to dial the telephone.

In an attempt to increase the efficiency of a user of a telephone, it is known to design "smart" telephones in which microprocessors are included within the telephone circuitry to implement various desired functions. For example, in the telephone described in the Anderson, et al., U.S. Pat. No. 4,291,198 a telephone unit includes a handset, video display screen, keyboard, and microcomputer which provides "the power of computer based services" to the telephone user. The microcomputer in the Anderson, et al., patent is dedicated to the telephonic functions. In the Hoff, et al., U.S. Pat. No. 3,932,709, electronic circuitry is embedded within the telephone housing to store and display telephone numbers and perform local arithmetic computations. The circuitry within the telephone of Hoff, et al., can also memorize numbers for subsequent redialing upon demand. Again, the circuitry of the Hoff, et al., device is dedicated to the telephonic functions.

In the Squicciarini, U.S. Pat. No. 4,535,198, a digital terminal keyboard may be used to send digital signals to a system processor for call origination. The system processor of the telephone switching system treats the digital signals as a series of control messages for dialing a telephone line.

The May, et al., U.S. Pat. No. 4,431,870 describes a computer input/output device which is disclosed as performing the functions of a telephone. The device includes a video display terminal connected to a central processor which controls the video display and is capable of generating output tones corresponding to telephone keys.

In the Kessler, U.S. Pat. No. 4,503,288 a great variety of controllers and communications devices are connected to a microprocessor by way of a data bus. The unit operates to perform a variety of specific functions; however, it is not disclosed as being capable of running a wide variety of programs, i.e., it is not a general purpose computer.

Telephone signalling is often accomplished through the transmission of a predetermined set of frequency tones. Each of the tones selected represents one of the twelve dialing digits of a telephone, i.e., 0, 1, 2, . . . 9, *, #. Within the United States and many other countries, a standard set of tones is utilized in which each "tone" is comprised of two tones being sounded simultaneously, called Dual Tone Multi Frequency (or "DTMF") signals. Because many telephones are equipped to send DTMF signals, such signals are becoming more widely used to transmit data or commands to other equipment once a telephone connection has been established. For example, such signals are known